D6 Steering Failure in a Triple Fatality Crash

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After attending this presentation, attendees will have a basic understanding of vehicle steering systems, the role of steering system failure in this particular crash, and the interpretation of available evidence that indicated the root cause of failure in relationship to the timing and location of the crash.

This presentation will impact the forensic science community by identifying a pre-crash failure that could easily be overlooked by an investigator unfamiliar with vehicle steering systems and the evidence and interpretation of the evidence that led to the discovery of this failure.

Crash reconstruction is the investigative process of examination and evaluation of all available physical evidence related to the crash in an attempt to determine the sequence of events prior to, during, and immediately after the crash. This is accomplished through an evaluation of the vehicles, tire marks, and potential electronic crash data imaged from vehicle control modules. Collectively, this evidence can be interpreted by a trained crash investigator and used to determine crash causation. This presentation will discuss the evidence and the interpretation of that evidence, which led to the determination of the root cause of a particular steering failure-related crash.

The physical evidence evaluated during a crash reconstruction includes, but is not limited to, the involved vehicle or vehicles (physical and electronic data), the roadway where the crash occurred, injuries to the vehicle occupants, and witness statements. Roadway evidence can be subdivided into pre-crash evidence, crash event evidence, and post-crash evidence. The point of crash impact separates these three roadway evidence subsections. Roadway evidence may include, but is not limited to, debris, tire marks, fluid trails, or vehicle components. Prior recall and repair history of the involved vehicles must be examined as this information may be vital in determining causation. Post-crash examination of the vehicles will reveal evidence about contact between the vehicles and specific damage, but combining vehicle evidence with evidence observed at the collision site, either physically or through the use of scene photographs, will provide a more complete reconstruction of the crash and crash sequence.

The case presented incorporates all of these factors and involves a late model Ford® E150 van that crossed over the center line on a two-lane road and struck a late model Toyota® Sienna® van. Both vehicles were traveling at approximately 55 miles per hour, pre-impact. Little to no pre-crash braking occurred before the driver's side front of the Ford® van impacted the driver's side front of the Toyota® van. Three of the four occupants of the Toyota® van were pronounced deceased at the crash site.

A detailed examination of both vehicles occurred prior to an evaluation of the available roadway and vehicle recall and repair history. While examining the Ford® van, it was discovered that the passenger-side outer tie rod had separated. The tie rod end ball stud was intact and had apparently "pulled out" of the socket; however, the tie rod end socket appeared relatively undamaged. This is not the typical observation made in this type of failure. Generally, if the ball stud pulls out of the socket, the socket is substantially deformed or broken. Furthermore, the typical failure mode for an outer tie rod end in a collision is fracture of the stud that secures the tie rod end to the steering knuckle as it is generally the smallest section and being threaded creates a ready-made notch for failure initiation and stud fracture.

Evaluation of the pre-crash roadway evidence, particularly the pre-crash tire marks left by the Ford® van, indicated that the passenger-side front tire had left an unexpected, non-braking marking on the roadway leading to the point-of-impact. The mark exhibited indications that the passenger-side front tire had been nearly perpendicular to the travel direction of the Ford® van, first to the left and then to the right, while this van continued its approximate forward travel direction.

Crash Reconstruction, Steering Failure, Tire Marks

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